






Improvements in and relating to pyramidal structural units and structures formed therefrom

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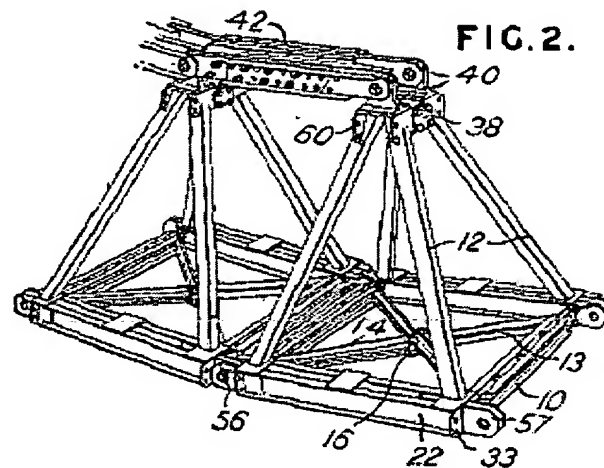
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Abstract of GB820485

820,485. Constructional metal units. ALTET, V. R. Sept. 4, 1956 [Sept. 8, 1955; Oct. 17, 1955], Nos. 25801/55 and 29606/55. Class 20(2) A
 A pyramidal structural unit comprises a rectangular base or its equivalent 10 detachably connected to a pair of identical and interchangeable triangular side frames 12 which are detachably connected at the apices by plates 38 which are independent of plates 40 for detachably connecting the units together, with the side frames 12 in the same plane, the base members 22 of the side frames having complementary connections 56, 57 for detachably connecting units together. The apices of the units are connected by connectors 42 longitudinally adjustable to form an arched structure with any desired curve. The base 10 may be formed of two triangular members 13, 14 bolted together at their apices by means of plates 16. The unit may be strengthened by bolting further side frames 12 to plates 33, 60. Units may be connected together by an inverted side frame 12.



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PATENT SPECIFICATION

DRAWINGS ATTACHED

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Index at acceptance:—Class 20(2), F1A.

International Classification:—E04c.

COMPLETE SPECIFICATION

Improvements in and relating to Pyramidal Structural Units and Structures formed therefrom

I, VICENTE ROGLA ALTET, a Spanish Citizen, of Calle O'Donnell 27, Madrid, Spain, do hereby declare the invention for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to structural units, to assemblies thereof and to structures, either of a temporary nature such as for the supporting of formwork or shuttering, or for the suspension of concrete beams or of a permanent nature such as bridges, or the like, formed therefrom.

Pyramidal structural units are recognised as having many advantages over other shapes and the present invention is concerned with the design of such units to ensure that they can be used with the greatest degree of effectiveness.

Among the considerations which arise in the use of such units are that it should be easy to assemble a unit from its component parts; that there should be a minimum of component parts or of different kinds of component parts; that the units be capable of being pre-assembled; i.e. before being used in the erection of a structure; that the units lend themselves to being assembled in different ways; that the units be capable of having at least some of their component parts duplicated or multiplied to enable the units to be adapted to different load conditions.

It is with such considerations in mind that the present invention has been developed.

The invention consists essentially in a pyramidal structural unit comprising a rectangular base and a pair of triangular side frames; the side frames are detachably connected to opposite sides of the base and are also detachably connected to each other at their apices; the side frames also have means at their apices for detachably connecting to-

gether a number of units with their side frames in the same planes; the apex side frame connections and the apex unit connections are independent of each other; the base members of the triangular side frames have complementary connecting means at each end so that the bases of a number of units can be connected together detachably; and the side frames are identical and interchangeable with each other.

A unit having those characteristics answers most of the considerations set out above.

In the preferred form of the invention, each side frame of the unit is provided with means for detachably fixing to it a further identical frame in a plane parallel to its own. In other words, the side frames can be duplicated or multiplied in order to increase the load-carrying capacity of the unit.

The base can be made in one piece or of two component parts. In either case, it can have two members forming one pair of opposite sides which are connected together by diagonal braces, the other two sides being open. Such a base can be made by connecting together at their apices, two identical triangular components.

By pivotally connecting the bases of a number of such units to each other and providing between the apices of the units connecting members of adjustable length, an assembly can be produced having any desired formation.

In order that such an assembly may have a greater load-bearing capacity without having its overall dimensions increased, the units can be provided with means allowing the connecting members to be replaced by a pair of side frames, the base members of the side frames being connected to the apices of adjacent units and the apices thereof being connected to the bases of adjacent units. Such means do not, however, have to be specially

provided as the existing connecting means enable this to be done.

In some cases, an assembly of substantial depth is required and means can be provided to enable a two-tier or multiple-tier assembly to be formed. Again, the connecting members referred to above are sufficient in themselves to enable this to be done. They are also sufficient to enable two assemblies to be connected together side-by-side.

In order that the invention may be more thoroughly understood and be more readily carried into effect an example of a unit in accordance therewith and some assemblies which can be formed with such units will now be described with reference to the accompanying drawings, in which:—

Figure 1 is a perspective view of the unit according to the invention,

Figure 2 is a perspective view of an assembly of two units according to Figure 1, drawn to a reduced scale,

Figure 3 is a fragmentary perspective view of a unit according to Figure 1, having duplicated side frames,

Figure 4 is a fragmentary perspective view of two assembled units connected together by a side frame,

Figure 5 is a diagrammatic side perspective view of a two-tier assembly of units, and

Figure 6 is a perspective view of a connector.

The unit shown in Figure 1 is made up of a rectangular base 10 and a pair of triangular side frames 12. The base can be in one piece or, as shown, be made up of two identical triangular components 13, 14 connected by bolts 15 passing through holes in plates 16 and having a rectangular outline.

It will be observed that the base 10 has two filled sides 17, 18 and two open sides, the sides 17, 18 being connected together by diagonal braces 19, 20. The open sides of the base are filled in by the base members 22 of the side frames 12.

The side members 17, 18 of the base and the braces 19, 20 are made up of angle sections. This has the advantage of providing strength and stiffness without excessive weight. They may, however, be of any desired cross-section and, in particular, be tubular and of rectangular or circular cross-section.

The base members of the triangular side frames 12 are formed of two channels 24, 25 spaced apart by spacers 26 while the sloping members 28, 29 are of hollow or tubular rectangular cross-section.

For connecting the components of the unit together, the components are provided at their corners with connecting members in the form of plates having holes for the reception of bolts.

At each end of the two side members 17, 18 of the base, there is a pair of connecting plates 30 which are fixed to the backs of the

component angles. The base members 22 of the triangular side frames have at each end a pair of connecting plates 32, 33 which project laterally from opposite sides thereof. The connecting plates 32 are spaced so that each plate can be engaged between a pair of connecting plates 30 on the members 17, 18 of the base so that bolt holes 35 in the respective plates become aligned to receive bolts 34.

The connecting plates 33 serve a purpose to be described later.

For connecting together the apices of the triangular frames, those frames are provided near their apices with inwardly projecting plates 36 having bolt holes. The plates on the two frames are opposite each other and are connected together by cover plates 38 and are fixed relatively to each other by bolts 37 passing through the holes in the plates 36 and corresponding holes in the cover plates.

The components of the unit described above are easy to manufacture, to handle and to assemble. The unit can be pre-assembled before it is used in an assembly of units. In order that the assembling of units may be effected without dismantling of the units or interfering in any way with the connections between their components, the side frames are provided with means for connecting them at their apices to the side frames of neighbouring units which are independent of the connections 36, 38. These independent means consist of plates 40 which project from the apices of the side frames away from the base of the unit and which are at right angles to the plates 36. These plates 40 are used in conjunction with connectors 42 (Figs. 2, 5, 6) of adjustable length.

Each connector 42 comprises a pair of channels 44 arranged back-to-back with a space between them in which is engaged two bars 46 spaced apart by spacers 48. The channels 44 and bars 46 are provided with series of holes 49 through which bolts 50 can be passed to clamp the assembly at any given adjusted length.

When two units are to be connected together with their side frames in the same planes, the narrow end of the connector (formed by the bars 46) is engaged around one of the plates 40 on one unit and the wide end (formed by the channels 44) is engaged around one of the plates 40 on the other unit. The plates 40 and the connector are then secured to each other by means of bolts 52 (Fig. 2). As shown, two connectors 42 are used to interconnect two units. At the wide end of the connector, spacing washers 54 are provided.

If a third unit is to be added at the wide end of the connector, the washers 54 are removed or dispensed with and the narrow end of a further connector 42 is engaged in the said wide end (Fig. 6).

For connecting the bases of adjacent units

together, the base members 22 of the side frames are provided at their ends with pairs of longitudinally extending plates 56, 57. The plates 56 are formed as extensions of the webs of the channels 24, 25 of which the base members are formed. The plates 57 are fixed to the backs of those channels and therefore the plates 56 on one side frame are engageable within the plates 57 on a side frame of a neighbouring unit. The plates are provided with bolt holes 58 through which bolts can be passed to provide a pivotal or hinge connection between the two units, as shown in Fig. 2.

By virtue of this hinge connection, the units described above can be assembled with their bases in the same plane or in different planes according to the adjusted length of the connectors 42 to provide a structure of great strength. There are, however, measures which can be adopted to increase the load-carrying capacity of the structure which do not involve using any components which are different from those from which the units are made up.

For example, the side frames 12 can be duplicated as shown in Figure 3. It is for this purpose that the plates 33 are provided and that similar plates 60 are provided at the apex of each side frame. If two side frames are placed face-to-face, the plates 33 on one will lie opposite the plates 32 on the other as will the apex plates 60. The two frames can then be joined by cover plates 62 similar to the cover plates 38, and bolts 64 passing through holes in the various plates.

As many side frames as are desired can be added in this way to a unit and corresponding frames added to neighbouring units can be connected to each other by connectors 42 in the manner described above.

Another way in which the load-carrying capacity of an assembly of units can be increased is to replace a connector 42 by a side frame 12 as shown in Figure 4, the apex plate 40 of the side frame being engaged between the plates 57 at the junction of the bases of the units between which the additional side frame is being provided.

A number of assemblies of units can be connected together side-by-side, the connecting means being the plates 33 and 60.

Another way of increasing the load-carrying capacity of the structure is to increase its depth by the provision of a number of tiers of assemblies as shown in Figure 5.

Assemblies of units in accordance with the invention lend themselves to many different uses. When used as supporting structure for formwork, they will generally be used with the bases of the units uppermost but they can be used the other way up. The bases of the units can form a track or a number of assemblies spaced apart side-by-side can form supports for a track.

Above all, the invention provides the ad-

vantages to be gained from the use of standardised units which are exceedingly flexible in their application to use in the field of civil and structural engineering construction.

It will be appreciated that the triangular side frame members are of identical construction and are completely interchangeable. There are therefore only three different parts viz:— the base, the side frame and the connector. This is true even if the base is of two-part construction as the two parts are identical with each other.

The various parts will, in general, be made of steel.

WHAT I CLAIM IS:—

1. A pyramidal structural unit comprising a rectangular base and a pair of triangular side frames which are detachably connected by their base members to opposite sides of the base and detachably connected together at their apices, in which the side frames have means at their apices for detachably connecting together a number of units with their side frames in the same planes in which the apex side frame connections and the apex unit connections are independent of each other and in which the base members of the side frames have complementary connecting means at each end to enable the bases of a number of units to be detachably connected together, the side frames being identical and interchangeable with each other.

2. A unit according to claim 1 in which each side frame is provided with means for detachably fixing a further identical frame to it in a plane parallel to its own plane.

3. A unit according to either preceding claims, in which the rectangular base is made up of two members forming opposite sides thereof and connected together by diagonal braces, the other two sides of the base being open and constituting the side to which the side frames are connected.

4. A unit according to claim 3, in which the base comprises two identical triangular components detachably secured to each other at their apices.

5. A unit according to any preceding claim, in which the complementary connections at each end of the base member of the side frames comprise pairs of parallel plates, the separation of the plates of the two pairs being such that one pair of plates on one frame can be engaged between the other pair of plates on another frame with bolt holes in the plates in alignment with each other.

6. A unit according to any preceding claim in which the means for connecting together the apices of the side frames of the unit comprise inwardly directed plates provided with bolt holes adapted to be brought into registration with bolt holes in cover plates and in which the means for connecting the apex of the unit to that of adjacent units comprise a pair of plates provided with bolt holes, ex-

tending one from the apex of each triangular frame away from the base member of the frame and at right angles to the inwardly directed plates.

5 7. A unit according to claims 2 and 6, in which the means for fixing a further frame to one of the side frames of the unit comprise a pair of parallel plates, provided with bolt holes, extending outwardly from the apex of
10 the frame in alignment with the inwardly directed plates.

8. A unit according to any preceding claim, in which the means for connecting the base of the unit and the base members of the side frames comprise a pair of plates projecting from the one part and a plate projecting from the other part so as to be engageable between the said pair of plates, all the plates being provided with registrable bolt holes.

20 9. A unit according to claim 8, in which the plate or plates on the base member are duplicated on each side thereof to enable further side frames to be connected thereto.

25 10. A unit according to any preceding claim, in which the sloping member of the triangular side frames are tubular.

30 11. A unit according to any preceding claim, in which the base members of the triangular side frames are composed of a pair of channels arranged back-to-back and spaced from each other.

12. A unit according to claim 5 and claim 11, in which one pair of parallel plates is

35 formed by extensions of the webs of one pair of channels and the other pair is formed of plates attached to the backs of the channels.

13. A unit according to any preceding claim, in which the base is formed of tubular members.

40 14. An assembly of structural units according to any preceding claim, in which adjacent units are pivotally connected to each other at their apices by members of adjustable length and at their bases by hinges.

45 15. An assembly of structural units according to any preceding claim, in which the corresponding side frames of adjacent units are joined at their apices by the base member of a further identical side frame and at their bases to the apex of the further frame.

50 16. A structural unit substantially as hereinbefore described with reference to Figure 1 or Figure 3 of the accompanying drawings.

55 17. An assembly of structural units substantially as hereinbefore described with reference to Figure 2 or Figure 4 or Figure 5 of the accompanying drawing.

60 18. A permanent or temporary structure formed of units or an assembly according to any preceding claim.

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PROVISIONAL SPECIFICATION No. 25801 A.D. 1955

Improvements in and relating to 'Pyramidal Structural Units and Structures formed therefrom

I, VICENTE ROGLA ALTET, a Spanish Citizen, of Calle O'Donnell 27, Madrid, Spain, do hereby declare this invention to be described in the following statement:—

65 The present invention relates to structures more particularly structures formed from a plurality of structural units of pyramidal form, and has for an object to provide an improved structural unit of pyramidal form
70 which is demountable and is formed of a reduced number of individual parts which are adapted to permit the units to be assembled one to another in a variety of ways to provide structures adapted to support loads of differing characteristics.

75 According to the invention a structural unit of pyramidal form comprises a base frame and a pair of triangular side frames detachably supported thereby and means detachably securing the respective apices of the side frames together, the said side frames being of identical construction. Conveniently the base frame comprises two sub-frames of identical construction detachably secured together.

85 The said sub-frames conveniently comprise triangular shaped frames adapted to be secured together with their respective apices in

juxtaposition thereby to provide a rectangular base frame having crossed, diagonally extending brace members, the ends of the respective bases of the triangular sub frames being adapted to be detachably secured to the respective base members of the side frames, the said bases of the triangular sub-frames thus forming opposed parallel sides of the base frame which extend between the side frames to support the base members of the side frames in spaced parallel relation. The said base members of the side frames are provided at each end with means for pivotally securing
100 the base members of the side frames of one structural unit to the base members of a like unit for pivotal movement about an axis extending parallel to the said opposed parallel sides of the respective base frames of the units.

105 There are also provided connecting members for connecting the apices of a pair of structural units thus pivotally secured together, the said connecting members being adjustable in length to permit the relative angular displacement of adjacent units to be varied thereby to vary the contour of the structure formed by the units.

The invention will now be described with

820,485 COMPLETE SPECIFICATION

3 SHEETS

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SHEETS 2 & 3

Fig. 3.

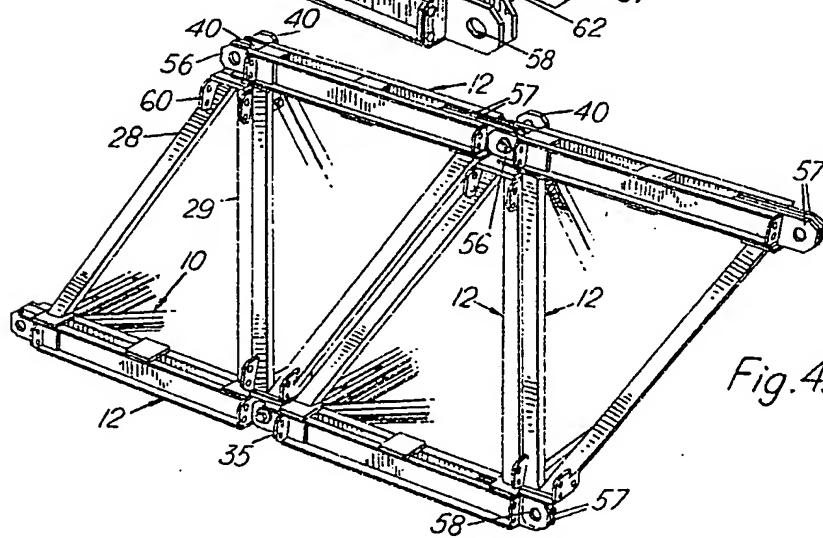
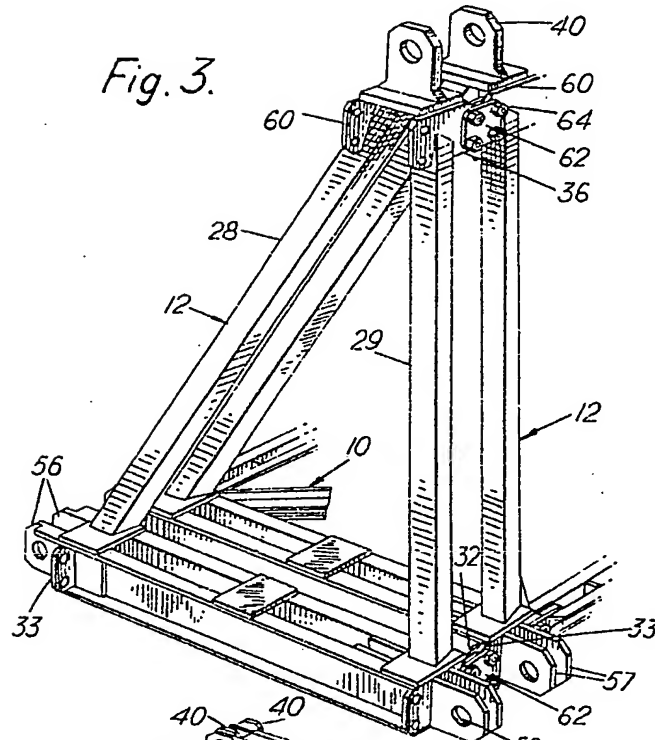
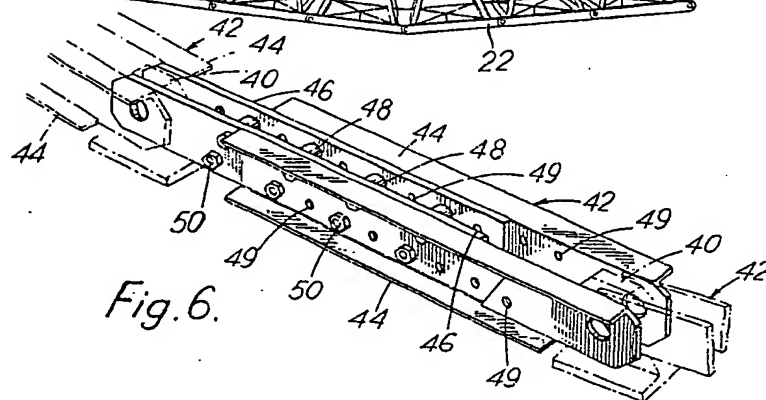
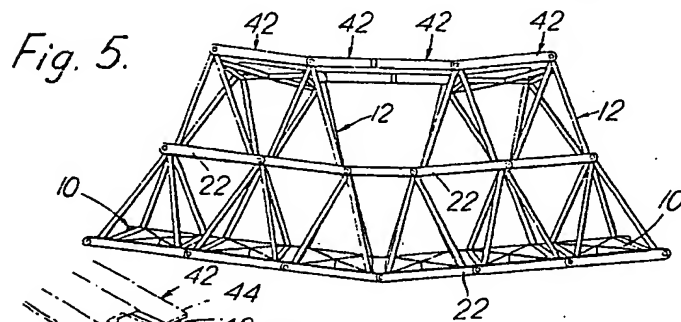
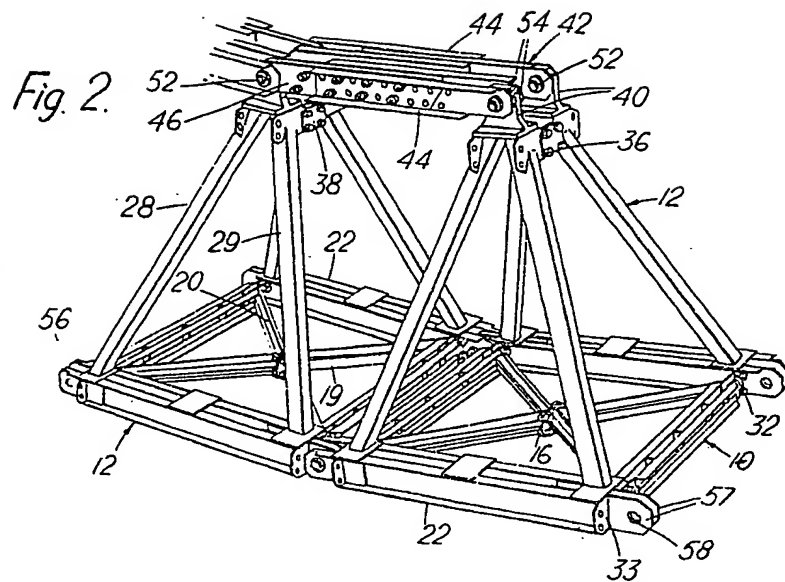


Fig. 4.



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SHEET 1

Fig. 1.

